

CARBOLVE

Carbon Vane Material Selection Guide

Material Grades for Vacuum Pumps, Compressors and Dry-Running Rotary Vane Systems

Carbon Graphite	Electrographite	Fine-Grain Carbon
Resin-Treated	Extreme Dry	High Humidity

Version 1.0 | Development Target Values

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1. Material Grade Overview

CARBOLVE vane materials are organized around dry-running behavior, mechanical strength, wear, thermal stability, dimensional stability and operating environment. Grade numbers identify the position within each family and do not equal density, speed, temperature or competitor equivalence.

Series	Material Family	CARBOLVE Grades	Typical Applications
CVV-CG	Carbon Graphite	CG20 / CG30 / CG35 / CG40	General dry vacuum pumps, compressors, automotive pumps
CVV-EG	Electrographite	EG20 / EG30 / EG35 / EG40	High-temperature and high-speed dry-running pumps
CVV-FG	Fine-Grain Carbon Graphite	FG30 / FG35 / FG40	Precision, long-life and low-wear vane systems
CVV-RG	Resin-Treated Carbon Graphite	RG20 / RG30	Wet/lubricated or special compact vane applications
CVV-SP	Special Treated Carbon / Graphite	SP40-D / SP40-H	Extreme dry or high-humidity environments

Grade Code Example

CVV-CG30 = CARBOLVE Vane Material / Carbon Graphite / High Strength Grade.

20 = general purpose **30** = high strength / high performance **35** = low-friction / high-speed / low-wear direction **40** = severe duty / high temperature.

2. Core Carbon Vane Material Grades

The values below are provisional typical development targets for preliminary material selection.

Grade	Material	Density g/cm³	Flexural MPa	CTE x10 ⁻⁶ /K	Thermal W/mK	Temp °C	Speed m/s	Typical Application
CVV-CG20	Carbon Graphite	1.75	62	4.4	14	180-250	20-35	General dry rotary vane pumps
CVV-CG30	Carbon Graphite	1.82	72	4.4	14	200-300	25-40	Industrial / automotive vacuum pumps
CVV-CG35	Carbon Graphite	1.78	68	4.4	16	180-260	35-50	High-speed compact pumps
CVV-EG30	Electrographite	1.80	62	3.8	52	450-550	35-50	High-performance dry vacuum pumps
CVV-EG40	Electrographite	1.83	68	3.9	55	500-600	35-55	High-temperature dry-running pumps
CVV-FG30	Fine-Grain Carbon	1.83	80	4.4	15	200-300	30-45	Precision / medical / lab vacuum pumps

Core positioning

CG20: general dry-running vane. **CG30**: higher strength and dimensional stability. **CG35**: low-friction / high-speed direction. **EG30 / EG40**: higher thermal conductivity and temperature capability. **FG30**: precision fine-grain grade with stronger edge stability.

3. Extended Material Grades

Grade	Material / Treatment	Density g/cm ³	Flexural MPa	Porosity vol. %	Thermal W/mK	Temp °C	Typical Application
CVV-CG40	Heavy-Duty Carbon Graphite	1.84	78	3-7	16	250-350	Heavy-duty industrial pumps
CVV-EG20	Electrographite	1.77	48	7-10	60	400-500	General high-temperature dry pumps
CVV-EG35	High-Speed Electrographite	1.81	60	6-9	58	450-550	High-speed dry pumps
CVV-FG35	Low-Wear Fine-Grain Carbon	1.85	85	2-4	15	200-300	Long-life precision pumps
CVV-FG40	Severe-Duty Fine-Grain Carbon	1.87	95	1-4	17	250-350	High-load precision vane pumps
CVV-RG20	Resin-Treated Carbon Graphite	1.80	68	≤3	11	160-200	Wet/lubricated special service
CVV-RG30	High-Strength Resin-Treated	1.85	80	≤2	11	180-220	Special high-strength vane service
CVV-SP40-D	Special - Extreme Dry	1.75-1.90	70-90	TBD	15-60	250-500	Extremely low-humidity dry running
CVV-SP40-H	Special - High Humidity	1.75-1.90	65-85	TBD	15-60	200-400	High-humidity gas service

4. Quick Material Selection Guide

Operating Need	First Choice	Alternative
General dry rotary vane vacuum pump	CVV-CG20	CVV-CG30
Higher-load industrial vacuum pump	CVV-CG30	CVV-FG30
High-speed compact vacuum pump	CVV-CG35	CVV-EG35
High-temperature dry-running pump	CVV-EG40	CVV-EG30
Precision medical / laboratory pump	CVV-FG30	CVV-FG35
Long-life / low-wear requirement	CVV-FG35	CVV-CG30
Wet or lubricated special vane	CVV-RG20	CVV-RG30
Extremely dry environment	CVV-SP40-D	CVV-EG40
High-humidity gas service	CVV-SP40-H	CVV-CG30

Information Required for Final Grade Selection

Pump type - vane dimensions - rotor/stator material - operating pressure / vacuum level - rotational speed - peripheral speed - gas or medium - temperature - humidity - duty cycle - required service life - allowable wear / debris.

Engineering note: Carbon vane performance depends on the complete tribological system. The same material may show different wear and friction when speed, slot clearance, counterface, humidity, temperature or gas composition changes.

5. Technical Notes

Development status

All values in this guide are development targets intended for preliminary selection. They are not guaranteed specification limits.

Flexural strength

Bending strength is especially important for thin vanes and edge durability. Test geometry and loading method must be standardized.

Friction and wear

Coefficient of friction and wear rate are system-dependent and should only be published with defined counterface, speed, load, temperature and humidity.

Humidity

Dry-running carbon and graphite materials can respond strongly to humidity. Extreme-dry and high-humidity claims require controlled RH testing.

Temperature

Temperature capability depends on oxidation environment and treatment. Oxidizing and inert/non-oxidizing conditions should be separated.

Peripheral speed

Recommended vane speed is an application guideline, not a universal maximum material rating.

Website publication

After CARBOLVE completes stable-batch and pump-rig validation, 'Development Target Values' can be changed to 'Typical Material Properties'.

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For material recommendations, provide your pump model, vane size, speed, vacuum level, medium, temperature and humidity.